Abstract

Concrete curing is closely related to cement hydration, microstructure development, and concrete performance. Application of a liquid membrane-forming curing compound is among the most widely used curing methods for concrete pavements and bridge decks. Curing compounds are economical, easy to apply, and maintenance free. However, limited research has been done to investigate the effectiveness of different curing compounds and their application technologies. No reliable standard testing method is available to evaluate the effectiveness of curing, especially of the field concrete curing.

The present research investigates the effects of curing compound materials and application technologies on concrete properties, especially on the properties of surface concrete. This report presents a literature review of curing technology, with an emphasis on curing compounds, and the experimental results from the first part of this research—lab investigation. In the lab investigation, three curing compounds were selected and applied to mortar specimens at three different times after casting. Two application methods, single- and double-layer applications, were employed. Moisture content, conductivity, sorptivity, and degree of hydration were measured at different depths of the specimens. Flexural and compressive strength of the specimens were also tested. Statistical analysis was conducted to examine the relationships between these material properties.

The research results indicate that application of a curing compound significantly increased moisture content and degree of cement hydration and reduced sorptivity of the near-surface-area concrete. For given concrete materials and mix proportions, optimal application time of curing compounds depended primarily upon the weather condition. If a sufficient amount of a high-efficiency-index curing compound was uniformly applied, no double-layer application was necessary. Among all test methods applied, the sorptivity test is the most sensitive one to provide good indication for the subtle changes in microstructure of the near-surface-area concrete caused by different curing materials and application methods. Sorptivity measurement has a close relation with moisture content and degree of hydration. The research results have established a baseline for and provided insight into the further development of testing procedures for evaluation of curing compounds in field. Recommendations are provided for further field study.